4.11 Invasive Terrestrial and Aquatic Animals and Terrestrial Plants

4.11.1 Introduction

Changes in the reservoir operations policy may affect population abundance and spread of invasive terrestrial and aquatic animals and terrestrial plants. Changes in land use can influence the abundance and spread of both invasive terrestrial animals and plants. Changes in water quality, elevation, and flow can influence the abundance and spread of invasive aquatic animal species.

Resource Issues

- Population abundance and spread of invasive terrestrial and aquatic animals and terrestrial plants

The study area for this topic included a zone of 1 mile from the reservoirs and tailwaters, because any impacts from the policy alternatives would be evident within this zone.

Invasive Terrestrial Animals and Plants

Eight invasive terrestrial animal species that pose a serious threat to terrestrial communities in the TVA reservoir system would be potentially affected by the alternatives. They include:

- The red imported fire ant (*Solenopsis invicta*) preys on ground-nesting birds, reptiles, and other wildlife and has been linked to the decline of native species.
- The Asian tiger mosquito (*Aedes albopictus*) is known as a potential vector (transmitter) of various diseases of humans and domestic animals.
- Nutria (*Myocastor coypus*), a large semi-aquatic rodent, constructs burrows that commonly damage dams and irrigation facilities, and weaken river and streambanks. Nutria have caused significant crop damage.
- The European starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), rock dove (*Columba livia*), house finch (*Caropodacus mexicanus*), and Eurasian collared dove (*Streptopelia decaocto*) are birds with similar distributions that pose a similar severity of threat. These species all compete with native birds.

Of the 19 invasive terrestrial plants identified as priority species for TVA, the most problematic species are common privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), Japanese knotweed (*Polygonum cuspidatum*), and Nepal grass (*Microstegium vimineum*). These species compete with native species, and their abundance has been linked to the decline of native species. Areas that contain protected plants or uncommon community types are of particular concern.

Invasive Aquatic Animals

Six invasive aquatic animal species pose a serious threat to aquatic communities in the TVA reservoir system: common carp (*Cyprinus carpio*), grass carp (*Ctenopharyndogon idella*),

alewife (*Alosa pseudoharengus*), rusty crayfish (*Orconectes rusticus*), Asiatic clam (*Corbicula fluminea*), and zebra mussel (*Dreissena polymorpha*). The Asiatic clam and zebra mussel are the most problematic of these species in the Tennessee River system, because these two species adhere to raw water intake systems at power plants and city water supplies.

4.11.2 Regulatory Programs and TVA Management Activities

Regulatory Programs

Executive Order 13112—Invasive Species requires federal agencies to (1) prevent the introduction of invasive species, (2) detect and respond rapidly to control populations of such species in a cost-effective and environmentally sound manner, (3) monitor invasive species populations accurately and reliably, and (4) provide for restoration of native species and habitat conditions in ecosystems that have been invaded. Consistent with this order, this EIS has considered the effects of the reservoir operations policy alternatives on invasive species.

TVA Management Activities

TVA conducts a variety of ongoing management activities to control invasive terrestrial plants and aquatic animals. Through its Natural Areas Management Program, the TVA has actively managed invasive terrestrial plants on lands known to contain rare plants or uncommon plant communities. Historically, invasive terrestrial plants were controlled mainly by hand removal, with limited herbicide application. Hand removal is still used, but herbicides are used to a greater extent now because more is known about this approach and more effective herbicides are available. Fire suppression occasionally is used, although recent forest fires have limited this option.

For invasive aquatic animals, TVA conducts an active program to monitor the populations of Asiatic clams and zebra mussels at power projects. When required, TVA uses chemical and warm-water treatments to control Asiatic clams and zebra mussels at generating facilities. TVA does not conduct management activities associated with the other invasive aquatic species.

4.11.3 Population Abundance and Spread of Invasive Terrestrial Animals and Plants

Existing Conditions

Red imported fire ants have rapid colonization capabilities and are distributed in five of the seven states in the TVA system (Mississippi, Alabama, Georgia, Tennessee, and North Carolina). They nest primarily in open areas, pastures, and fields; any existing or newly created open areas are potential habitats that may facilitate their spread. The early pattern of dispersal for Asian tiger mosquitoes subsequent to their arrival in the United States followed the interstate highway system, suggesting a relationship to human activity. Residential and urban areas commonly offer suitable habitat for this species. Artificial containers prevalent among dense human populations facilitate their spread.

Nutria has been reported in the Tennessee Valley from Pickwick Reservoir at the confluence of Bear Creek and the Tennessee River. The rodents inhabit marshes, reservoir edges, and sluggish streams—particularly in areas with emergent or succulent vegetation. They use natural and human-made waterways extensively for travel. Any drainage that holds water can facilitate their spread. Four of the five identified invasive bird species are abundant throughout the Tennessee Valley. They exploit a variety of habitats, but their populations are generally associated with human habitation.

Invasive terrestrial plant species are dispersed by a variety of means, including ingestion of fruits and seeds and transport by wildlife (common privet and Japanese honeysuckle), production of vegetative runners that form mats (Japanese honeysuckle), spreading by rhizomes (Japanese knotweed), and rooting at nodes along the stems and prolific seed production (Nepal grass). These plant species are abundant throughout the Tennessee Valley; creating new openings and edges facilitates their spread.

Future Trends

Creating open habitats facilitates the spread of most of the invasive terrestrial animals considered in this analysis. For some species, movements and habitat preferences are tied to waterbodies and associated wetlands. Populations of priority invasive terrestrial animals are expected to increase with urban and industrial development. The invasive terrestrial plant species identified as a priority for TVA respond similarly to the creation of open habitat and changes in water level and duration, as well as forest fragmentation resulting from land development and habitat edges created from land conversion. Populations of all invasive terrestrial plant species are expected to increase throughout the TVA system as more edge is created and more forests become fragmented due to land development. Increasing global trade would also likely result in the introduction of more invasive species into the Valley.

4.11.4 Population Abundance and Spread of Invasive Aquatic Animals

Existing Conditions

Several invasive aquatic species, common carp, alewife, grass carp, zebra mussel, Asiatic clam, and rusty crayfish, have become management priorities for the TVA. These species have a wide distribution in the Tennessee River watershed. Common carp have been part of Tennessee River aquatic communities for over 100 years and are presently found in all waterbodies of the TVA reservoir system. Grass carp are reported primarily in the lower portions of the system. Following their introduction into Watauga and South Holston Reservoirs by Tennessee Wildlife Resources Agency (TWRA) in 1976, alewives have moved downstream into Boone, Fort Patrick Henry, and Cherokee Reservoirs as well as river segments in between. Rusty crayfish range expansion began about 30 years ago and is ongoing; this species is now well established in the Clinch, Holston, and Nolichucky River systems—including Norris Reservoir (Williams and Bivens 1996). Bait bucket introductions of alewife and rusty crayfish account for their present dispersal in the Tennessee River system (Baxter pers. comm.).

Asiatic clams were discovered in the Ohio River in 1957 and have spread to virtually all the contiguous states. The clams occur throughout the TVA system except for cold tailwaters and certain deep tributary reservoirs with seasonally low DO. For Asiatic clams, humans are the primary agents of dispersal (Counts 1986).

Zebra mussels were first documented in the TVA system in 1992, in Kentucky Reservoir, and are now found all along the mainstem navigation channel. Zebra mussels cannot disperse upstream on their own but do release larvae, which can float downstream for long distances before settling. This species can live in most aquatic habitats with firm substrates and can exist in extremely dense mats.

Future Trends

The continued spread or threat of alewife, Asiatic clam, and zebra mussel depends primarily on alterations to the aquatic environment. All three of these species are limited by water quality: alewives, primarily by temperature and low DO; the clam and mussel, primarily by low DO. Because Asiatic clams and zebra mussels attach by their bases, they are more susceptible to changes in water quality, water elevation, and flow. Zebra mussels have the ability to detach and move if changes in habitat parameters are not rapid. Under the present reservoir operations regime, their attainable population levels and potential effects remain to be seen. However, the common carp, grass carp, and rusty crayfish are all highly tolerant of poor water quality conditions and are expected to continue spreading throughout most of the Tennessee River system.